



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/998,469	11/29/2001	Narayan Solayappan	13176.403	5686

24283 7590 06/16/2003

PATTON BOGGS  
PO BOX 270930  
LOUISVILLE, CO 80027

EXAMINER
----------

PERALTA, GINETTE

ART UNIT	PAPER NUMBER
----------	--------------

2814

DATE MAILED: 06/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/998,469

Applicant(s)

SOLAYAPPAN ET AL.

Examiner

Ginette Peralta

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 April 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-46 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-46 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

DETAILED ACTION

*Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 38-44 and 46 are rejected under 35 U.S.C. 102(a) as being anticipated by Amanuma (U. S. Pat. 6,188,098 B1).

Regarding claim 38, Amanuma discloses in Fig. 29 an integrated circuit comprising a thin film of metal oxide material 9; and a hydrogen barrier layer located to inhibit the diffusion of hydrogen to the metal oxide material 9, the hydrogen barrier layer comprising a primary hydrogen barrier layer material (7 or 11) and a supplemental hydrogen barrier layer material 12; the primary hydrogen barrier layer material being different than the supplemental hydrogen barrier material, and wherein the primary and supplemental materials are either both conducting or both insulating, and wherein the primary hydrogen barrier layer and the supplemental hydrogen barrier layer both inhibit diffusion of hydrogen to the metal oxide material from essentially the same direction over the majority of the length of the shortest one of the primary hydrogen barrier layer and the supplemental hydrogen barrier layer.

Regarding claim 39, Amanuma discloses that the supplemental material 12 is located in contact with the primary material 11.

Regarding claim 40, Amanuma discloses that the primary material and the secondary material are both conducting when referring to the layers 11 and 12, as shown in col. 8, ll. 38-60.

Regarding claim 41, Amanuma discloses a primary material 7 and a secondary material 12, wherein both are insulating, as shown in col. 6, ll. 19-67.

Regarding claim 42, Amanuma discloses a primary material 11 that is more compatible with the metal oxide 9 and is located closer to the metal oxide material.

Regarding claim 43, Amanuma discloses the primary material comprising one of the chemical elements that is in the metal oxide material, as shown by the use of SBT or PZT for the metal oxide, and titanium nitride or tantalum nitride for the hydrogen barrier layer.

Regarding claim 44, Amanuma discloses the use of SBT, which is a superlattice material.

Regarding claim 46, Amanuma discloses that the supplemental material comprises silicon nitride.

*Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4, 10-12, 20-22, 28-30 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanaya (US Pat. Pub. 2002/0038402 A1) in view of Shimida et al. (U. S. Pat. 6,351,004 B1).

Kanaya discloses in Fig. 31B an integrated circuit comprising a thin film of metal oxide material 304; and a hydrogen barrier layer 402 located to inhibit the diffusion of hydrogen to the metal oxide material, selected from the group comprising titanium oxide, zirconium oxide and aluminum oxide, among others.

Kanaya discloses the claimed invention with the exception of the hydrogen barrier layer comprising one of strontium tantalite, bismuth tantalate, or tantalum oxide.

Shimida discloses an integrated circuit comprising a thin film of metal oxide material 6, and a hydrogen barrier film that comprises one of silicon oxide, strontium tantalate or strontium titanate, wherein one of these materials is used for the disclosed intended purpose of preventing the oxidation of the conductive layers surrounding the metal oxide material.

Thus, it would have been within the scope of one of ordinary skill in the art at the time the invention was made to use other materials for the hydrogen barrier material and take advantage of other benefits like the disclosed intended purpose of Shimida of preventing the oxidation of the layers that make contact with the

ferroelectric material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Regarding claim 2, Kanaya discloses that the metal oxide 304 comprises a perovskite ( $\text{PbTiO}_3$ ).

Regarding claim 3, Kanaya discloses that the metal oxide comprises lead zirconium titanate (PZT), an inherent property of this material is having a dielectric constant of 20 or more.

Regarding claim 4, Kanaya discloses that the metal oxide comprises a ferroelectric material, lead zirconium titanate (PZT).

Regarding claim 10, Kanaya as modified by Shimida above, discloses the use of strontium tantalate as a hydrogen barrier layer material.

Regarding claim 11, Kanaya further discloses a capacitor having a first electrode 303 and a second electrode 305, and the metal oxide material 304 is located between the first and second electrodes.

Regarding claim 12, Kanaya discloses the capacitor being a ferroelectric capacitor, and the metal oxide being a ferroelectric material.

Regarding claim 20, Kanaya discloses the integrated circuit including a semiconducting substrate 1, and the metal oxide 304 is located between the hydrogen barrier layer and the substrate.

Regarding claim 21, Kanaya discloses in Fig. 32, the integrated circuit including a wiring layer 306c and a second hydrogen barrier layer 403 located above the wiring.

Regarding claim 22, Kanaya discloses in Fig. 32, the integrated circuit including a substrate 301, and a wiring layer 306c, the metal oxide material 304 being located between the wiring layer and the substrate, and the hydrogen barrier layer 403 located above the wiring layer.

Regarding claim 28, Kanaya discloses in Fig. 32, an integrated circuit comprising a thin film of metal oxide material 304 and a hydrogen barrier layer 402 located to inhibit the diffusion of hydrogen to the metal oxide material, the hydrogen barrier layer comprising an amorphous material.

Kanaya discloses the claimed invention with the exception of the hydrogen barrier layer material being one of strontium tantalate, bismuth tantalate and tantalum oxide.

Shimida discloses an integrated circuit comprising a thin film of metal oxide material 6, and a hydrogen barrier film that comprises one of silicon oxide, strontium tantalate or strontium titanate, wherein one of these materials is used for the disclosed intended purpose of preventing the oxidation of the conductive layers surrounding the metal oxide material.

Thus, it would have been within the scope of one of ordinary skill in the art at the time the invention was made to use other materials for the hydrogen barrier material and take advantage of other benefits like the disclosed intended purpose of

Shimida of preventing the oxidation of the layers that make contact with the ferroelectric material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Regarding claim 29, Kanaya discloses the integrated circuit comprising a capacitor having a first electrode 303 and a second electrode 305, and the metal oxide is located between the first and second electrodes.

Regarding claim 30, Kanaya discloses that the metal oxide comprises a ferroelectric material, lead zirconium titanate (PZT).

Regarding claim 36, Kanaya discloses the use of PZT, which inherently has a crystallization temperature greater than 650°C.

Regarding claims 14-16 and 32- 35 Kanaya discloses the claimed invention with the exception of the integrated circuit comprising a field effect transistor having a substrate and a gate electrode and the metal oxide material being located between the substrate and the gate electrode.

Shimida discloses in fig. 5 an integrated circuit comprising a field effect transistor comprising a substrate 1 and a gate electrode 7, and the metal oxide material 6 being located between the substrate and the gate electrode; wherein the FET is a ferroelectric FET and the metal oxide comprises a ferroelectric material, and further a superlattice material.



5. Claims 5-8, 13, 17, 18, 23-27, 31, 35, 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kanaya in view of Shimida et al. as applied to claims 1-4, 10-12, 20-22, 28-30 and 36 above, and further in view of Amanuma.

With regards to claims 5-8, 13, 31, Kanaya as applied above discloses the claimed invention with the exception of metal oxide comprising a layered superlattice material.

Amanuma discloses in Fig. 1 an integrated circuit comprising a thin film of metal oxide material 9; and a hydrogen barrier layer (7, 11, 12) located to inhibit the diffusion of hydrogen to the metal oxide material, the metal oxide comprising one of strontium bismuth tantalate(SBT) or lead zirconium titanate(PZT), where the SBT and the PZT are used as alternatives, and the SBT is a layered superlattice material.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use either strontium bismuth tantalate or lead zirconium titanate, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regards to claims 17, 18, 35, and 37, Amanuma discloses in col. 6, ll. 52-53, the hydrogen barrier layer having a thickness of 100 Å. It would have been an obvious matter of design choice to vary the thickness of the hydrogen barrier layer, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

With regards to claims 23, 24, 25, 26, 27, Kanaya discloses the claimed invention with the exception of the hydrogen barrier layer comprising a primary and a supplemental hydrogen barrier layer.

Amanuma discloses a hydrogen barrier layer comprising a primary hydrogen barrier layer 11 and a supplemental hydrogen barrier layer 12 different from the primary hydrogen barrier layer, wherein the supplemental barrier layer is used for the disclosed intended purpose of encapsulating the capacitor portion and preventing the deterioration of the ferroelectric metal oxide, and further teaches the supplemental hydrogen barrier layer comprising silicon nitride, or titanium nitride.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a supplemental hydrogen barrier layer in the invention of Kanaya for the disclosed intended purpose of Amanuma of encapsulating the capacitor portion and preventing the deterioration of the ferroelectric metal oxide.

6. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amanuma as applied to claims 38-44 and 46 above, and further in view of Shimida et al..

Amanuma discloses the claimed invention with the exception of the hydrogen barrier layer comprising one of strontium tantalite, bismuth tantalate, tantalum oxide, titanium oxide, zirconium oxide and aluminum oxide.

Shimida discloses an integrated circuit comprising a thin film of metal oxide material 6, and a hydrogen barrier film that comprises one of silicon oxide, strontium tantalate or strontium titanate, wherein one of these materials is used for the disclosed

Art Unit: 2814

intended purpose of preventing the oxidation of the conductive layers surrounding the metal oxide material.

Thus, it would have been within the scope of one of ordinary skill in the art at the time the invention was made to use other materials for the hydrogen barrier material and take advantage of other benefits like the disclosed intended purpose of Shimida of preventing the oxidation of the layers that make contact with the ferroelectric material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

#### *Response to Arguments*

7. Applicant's arguments with respect to claims 1-46 have been considered but are moot in view of the new ground(s) of rejection.

#### *Conclusion*

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

Art Unit: 2814

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

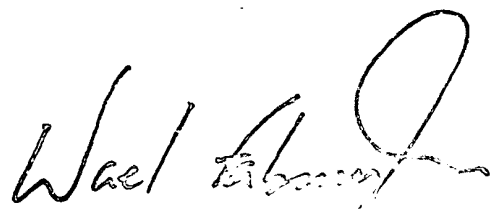
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ginette Peralta whose telephone number is (703)305-7722. The examiner can normally be reached on Monday to Friday 8:00 AM- 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703)308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

GP

June 12, 2003



SUPERVISORY PRIMAVERA  
TECHNOLOGY CENTER 2009